CLAIMS

1. A system (1) being powered by a battery which delivers a voltage V, and (2) for operation in a vehicle, comprising:

    a) a two-phase electric motor having

    i) a stator of the synchronous type and

    ii) two stator phases;

    b) a field-oriented controller for controlling voltages applied to the phases, wherein

    i) full battery voltage is available for application across each

        phase; and

    ii) all phase voltages are independently controllable.

2. System according to claim 1, wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, and the PWM applied to one phase is not simultaneous with the PWM applied to the other phase.

3. System according to claim 1, wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, and the PWM applied to one phase need not be simultaneous with the PWM applied to the other phase.

4. System according to claim 1, wherein maximum current generated in each phase is not limited by a voltage less than V.

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5. System according to claim 1, wherein the vehicle includes a power steering system, and the motor powers the power steering system.

6. A method for operation in a vehicle being powered by a battery which delivers a voltage V, comprising:

    a) maintaining a two-phase electric motor having

    i) a stator of the synchronous type and

    ii) two stator phases;

    b) maintaining a field-oriented controller for controlling voltages applied to the phases, which

    i) applies full battery voltage across each phase; and

    ii) provides independently controllable voltages to all phases.

7. Method according to claim 6, wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, and the PWM applied to one phase is not simultaneous with the PWM applied to the other phase.

8. Method according to claim 6, wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, and the PWM applied to one phase need not be simultaneous with the PWM applied to the other phase.

9. Method according to claim 6, wherein maximum current generated in each phase is not limited by a voltage less than V.

10. Method according to claim 6, wherein the vehicle includes a power steering system, and the motor powers the power steering system.

11. A system (1) for operation in a vehicle having a power steering system, and (2) being powered by a battery which delivers a voltage V, comprising:

    a) a two-phase electric motor having

    i) a stator of the synchronous type and

    ii) two stator phases;

    b) a field-oriented controller for controlling voltages applied to the phases, wherein

    i) full battery voltage is available for application across each

        phase; and

    ii) all phase voltages are independently controllable,

wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, the PWM applied to one phase need not be synchronized with the PWM applied to the other phase, and voltage V is available for application to each phase.

12. A method (1) for operation in a vehicle having a power steering system, and (2) being powered by a battery which delivers a voltage V, comprising:

a) providing a two-phase electric motor having

i) a stator of the synchronous type and

ii) two stator phases;

b) providing a field-oriented controller for controlling voltages applied to the phases, wherein

i) full battery voltage is available for application across each phase; and

ii) all phase voltages are independently controllable,

wherein pulse-width modulation, PWM, is used to control magnitude of current in each phase, the PWM applied to one phase need not be synchronized with the PWM applied to the other phase, and voltage V is available for application to each phase.

13. In an electric motor which has stator coils which produce a rotating stator field vector, and which is controlled by a control system implementing Field Oriented Control, a method comprising:

a) deriving data concerning behavior of the coils; and

b) based on the data, computing position of the stator field vector, without translating from an N-phase reference frame of the stator to an orthogonal reference frame, wherein N is greater than two.

14. Method according to claim 13, and further comprising:

    c) computing a demanded stator field vector in the rotating coordinate system; and

    d) computing currents required in the coils to produce the demanded stator field vector, without translating into an N-phase reference frame, wherein N is greater than two.

15. Method according to claim 13, wherein N equals three.

16. Method according to claim 14, wherein N equals three.

17. For an electric motor which has stator coils which produce a rotating stator field vector, and which is controlled by a control system implementing Field Oriented Control, a system comprising:

    a) means for deriving data concerning behavior of the coils; and

    b) means for receiving the data and computing position of the stator field vector, without translating from an N-phase reference frame of the stator to an orthogonal reference frame, wherein N is greater than two.

18. System according to claim 12, and further comprising:

    c) means for computing a demanded stator field vector in the rotating coordinate system; and

    d) means for computing currents required in the coils to produce the demanded stator field vector, without translating into an N-phase reference frame, wherein N is greater than two.

19. System according to claim 17, wherein N equals three.

20. System according to claim 18, wherein N equals three.

21. System according to claim 17, wherein all means comprise electronic circuitry, computer programs, or both.

22. System according to claim 18, wherein all means comprise electronic circuitry, computer programs, or both.

23. A system comprising:

    a) a motor comprising a two-phase stator of the synchronous type; and

    b) a control system which implements Field Oriented Control wherein the only coordinate transformations undertaken are (1) from a stationary system to a rotating system and (2) from the rotating system to the stationary system.

24. System according to claim 23, and further comprising

    c) a motor vehicle which includes a power steering system,

wherein the motor provides mechanical power to the power steering system.

25. A method comprising:

a) providing a motor comprising a two-phase stator of the synchronous type; and

b) providing a control system which implements Field Oriented Control wherein the only coordinate transformations undertaken are (1) from a stationary system to a rotating system and (2) from the rotating system to the stationary system.

26. Method according to claim 25, and further comprising

c) providing a motor vehicle which includes a power steering system, wherein the motor provides mechanical power to the power steering system.

27. A method, comprising:

a) in a vehicle, maintaining an electric motor having a stator of the synchronous type;

b) generating currents in coils of the stator, said currents producing a rotating stator field vector; and

c) obtaining an expression for orthogonal components of the stator field, without computing said components.

28. Method according to claim 27, and further comprising:

c) computing coordinates of the orthogonal components in a rotating coordinate system.

29. A system, providing:

    a) a power supply delivering a voltage V;

    b) a motor having phase coils in a synchronous-type stator; and

    c) a system for providing Field Oriented Control to the motor, wherein power in each phase coil equals V multiplied by the current in the phase.

30. System according to claim 29, and further comprising:

    d) a vehicle equipped with a power steering system, wherein the motor provides power to the power steering system.

31. A system, comprising:

    a) a vehicle;

    b) a power source - power receiver pair comprising

    i) an electrical power source in the vehicle, and

    ii) a mechanical device to be powered,

    the power source-power receiver having the characteristic that, when a 3-phase electric motor and Field Oriented Control implemented in a DSP are used to convert power from the source to the receiver, a computer program having N lines of code is required, and

    c) means for converting power from the source to the receiver which requires 0.75 N, or fewer, lines of code.

32. System according to claim 31, wherein the means comprises a 2-phase motor having a stator of the synchronous type.

33. Apparatus according to claim 1, wherein two duty cycles needed for synthesis of two sinusoids, one for each coil, are computed based on rotor angle and voltage magnitude.

34. Apparatus according to claim 33, wherein one duty cycle is computed as product of voltage magnitude and sine(rotor angle plus phase term) and the other duty cycle is computed as product of voltage magnitude and cosine(rotor angle plus the phase term).

35. Method according to claim 6, wherein two duty cycles needed for synthesis of two sinusoids, one for each coil, are computed based on voltage magnitude and rotor angle.

36. Method according to claim 35, wherein one duty cycle is computed as product of voltage magnitude and sine(rotor angle plus phase term) and the other duty cycle is computed as product of voltage magnitude and cosine(rotor angle plus the phase term).